R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

THE SPECIFICATION

On pages 2-3 of the Final Office Action, the Examiner contends that the Amendment filed on July 1, 2008 introduces new matter into the disclosure. In particular, according to the Examiner, since "the scope of the phrase "means for applying a negative voltage" is broader that [sic] the recitation of a top gate driver, the phrase constitutes new matter."

In response, the specification has been further amended to indicate that the top gate driver 11 corresponds to "means for applying a negative voltage <u>to each of the top gate electrodes</u>."

It is respectfully submitted that no new matter has been added, and it is respectfully requested that the amendments to the specification be approved and entered, and that the objection under 35 USC 132 be withdrawn.

THE CLAIMS

Independent claim 1 has been amended to incorporate the subject matter of claims 4 and 18-20, and claims 2-9, 14-16 and 18-20 have been canceled without prejudice.

No new matter has been added, and it is respectfully submitted that the amendments to the claims do not raise any new issues which require further consideration on the merits and/or a new search. Accordingly, it is respectfully requested that the amendments to the claims be approved and entered under 37 CFR 1.116.

THE PRIOR ART REJECTION

Claims 1, 4, 5, 8, 10-13 and 17-25 were all rejected under 35 USC 103 as being obvious in view of various combinations of USP 5,846,708 ("Hollis et al"), USP 6,093,370 ("Yasuda et al"), US 2002/0081716 ("Yagi"), USP 5,855,745 ("Manley"), USP 5,859,581 ("Morris"), USP 5,463,420 ("Yamada"), USP 5,381,028 ("Iwasa"), USP 5,551,975 ("Freeman et al"), and USP 6,395,558 ("Duveneck et al"). These rejections, however, are respectfully traversed with respect to independent claims 1 and 10 as amended hereinabove and claims 11-13, 17 and 21-25 depending therefrom.

According to the present invention as recited in amended independent claim 1, there is provided an optical DNA sensor comprising: a solid imaging device which is configured to have a plurality of types of DNA probes each including a different nucleotide sequence arrayed and fixed on a surface of the solid imaging device, a plurality of photoelectric elements provided in the solid imaging device, an exciting light absorbing layer

provided between the DNA probes and the photoelectric elements to selectively absorb exciting light and to selectively transmit fluorescent light which is emitted from a fluorescent substance excited by the exciting light, and a conductive layer which discharges charges caused by electron-hole pairs generated by the absorbed exciting light in the exciting light absorbing layer. As recited in amended independent claim 1, each of the photoelectric elements comprises a field effect transistor which has: (i) a semiconductor layer that has light sensitivity and that generates electric charges by receiving light, (ii) a bottom gate electrode, and (iii) a light transmissive top gate electrode. In addition, as recited in amended independent claim 1, a negative voltage is applied to the light-transmissive top gate electrode, and a positive voltage is applied to the conductive layer.

Similarly, according to the present invention as recited in independent claim 10, there is provided a DNA reading apparatus comprising an optical DNA sensor, and a light irradiation member. As recited in independent claim 10, the optical DNA sensor comprises a solid imaging device having a transparent substrate, a plurality of photoelectric elements which are arranged apart from each other on a surface of the transparent substrate and each of which includes a bottom gate electrode having a shading property, a semiconductor layer having a light sensitivity, and a

light-transmissive top gate electrode, wherein the bottom gate electrode, the semiconductor layer and the light-transmissive top gate electrode are layered in order on the transparent substrate, means for applying negative voltage to each of the light-transmissive top gate electrodes in a charge storage period, a light-transmissive protective layer which coats the plurality of photoelectric elements, and which is configured to have a plurality of types of DNA probes each including a different nucleotide sequence aligned and fixed thereon, and a transparent conductive layer which is provided in the solid imaging device between the DNA probes and the plurality of photoelectric elements, and to which a positive voltage is applied to attract a nucleotide strand. In addition, as recited in independent claim 10, the light irradiation member irradiates phosphor exciting light toward a rear surface of the transparent substrate of the solid imaging device.

Significantly, with the structure of the present invention as recited in amended independent claims 1 and 10, (the field effect transistor of) the photoelectric element can detect light corresponding to hybridization by continuously capturing electron holes having positive charges generated by the semiconductor layer on which light is incident, even with an electric field of a negative voltage applied to the light-transmissive top gate electrode.

Conventionally, since phosphate group of the sample DNA is ionized in solution and is negatively charged, the negative voltage applied to the light-transmissive top gate electrode (by the means for applying the negative voltage) causes easy repelling of the DNA probes, thereby preventing the hybridization with the DNA probe normally.

In order to overcome this problem and allow hybridization between the sample DNA and the DNA probes to be performed normally, according to the claimed present invention, a positive voltage is applied to the conductive layer. As a result, with the <u>structure</u> of the present invention as recited in amended independent claims 1 and 10, the hybridization is normally performed thereby capturing electron holes having positive charges generated by the semiconductor layer, and repelling of the DNA probes by the negative voltage applied to the light-transmissive top gate electrode is prevented.

As recognized by the Examiner, Hollis et al fails to disclose a field effect transistor having a light-transmissive top gate electrode to which a negative voltage is applied. For this reason, the Examiner has cited Yamada and/or Iwasa for the disclosure of a field effect transistor having a light-transmissive top gate electrode to which a negative voltage is applied.

However, it is respectfully submitted that Yamada does not disclose, teach or suggest adapting the field effect transistor thereof to a DNA sensor, and Yamada (of course) does not address the problem of the hybridization of DNA being prevented by the negative voltage of the light-transmissive top gate electrode when adapting the field effect transistor to the DNA sensor. Accordingly, it is respectfully submitted that one of ordinary skill in the art would have had no motivation to combine the teachings of Yamada and Hollis et al in the manner suggested by the Examiner.

With respect to Iwasa, moreover, it is noted that this reference merely discloses a <u>nonvolatile semiconductor memory</u> using MOS field-effect transistors. As disclosed in Iwasa, the transistors thereof are suitable for use in EEPROM (Electrically Erasable Programmable ROM) and EPROM (Erasable Programmable ROM). (See Background.) Thus, Iwasa is merely directed to the field of semiconductor memory/storage, and it is therefore respectfully submitted that Iwasa is non-analogous art. Accordingly, it is respectfully submitted that Iwasa is also <u>not</u> combinable with Hollis et al in the manner suggested by the Examiner.

Nevertheless, even if the cited prior art references were combinable in the manner suggested by the Examiner (i.e., even if the field effect transistor of Yamada and/or Iwasa were adapted to the DNA sensor of Hollis et al), it is respectfully submitted

that the problem of hybridization of DNA being prevented due to the negative voltage applied to the light-transmissive top gate electrode would not have been obvious to one of ordinary skill in the art.

Accordingly, it is respectfully submitted that even if the field effect transistor of Yamada and/or Iwasa were combinable with the DNA sensor of Hollis et al, such a combination would still not achieve or render obvious the structure and effects of the present invention as recited in amended independent claims 1 and 10 which solve the problem of hybridization being prevented due to the negative voltage applied to the light-transmissive top gate electrode.

Still further, although Yasuda et al discloses inducing polynucleotides in a solution to a surface of a substrate, it is respectfully submitted that Yasuda et al also does not recognize the problem of hybridization being prevented <u>due to the negative voltage applied to the light-transmissive top gate electrode</u>. For this reason, it is respectfully submitted that even if Yasuda et al were combinable with Hollis et al in the manner suggested by the Examiner, such a combination would also not achieve or render obvious the structure and effects of the present invention as recited in amended independent claims 1 and 10 which solve the problem of hybridization being prevented <u>due to the negative voltage applied to the light-transmissive top gate electrode</u>.

Yet still further, it is respectfully submitted that Yagi, Manley, Morris, Freeman et al and Duveneck et al, either separately or in combination, also do not recognize the problem of hybridization being prevented due to the negative voltage applied to the light-transmissive top gate electrode, and it is respectfully submitted that even if these references were combinable with any or all of the other cited references, the structure and effects of the present invention as recited in amended independent claims 1 and 10 which solve the problem of hybridization being prevented due to the negative voltage applied to the light-transmissive top gate electrode would still not be achieved or rendered obvious.

In view of the foregoing, it is respectfully submitted that amended independent claims 1 and 10, and claims 11-13, 17 and 21-25 depending therefrom, all clearly patentably distinguish over all of the cited references, taken singly or in any combination consistent with the respective fair teachings thereof, under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

/Douglas Holtz/

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